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Synergies among Producer Firms, Lead Users, and User Communities: The Case of the LEGO Producer–User Ecosystem*

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While many firms today proactively involve users in their new product development efforts using a wide variety of methods such as the lead user method, firm-hosted user communities, or mass customization toolkits, some pioneering firms are experimenting with the creation of sustainable producer–user ecosystems designed for the continuous exploration and exploitation of business opportunities. In this paper, the functioning of such ecosystems is studied with particular emphasis on the synergies they can yield. Based on an explorative and longitudinal multiple case study design, the producer–user ecosystem of the firm LEGO is analyzed, and three main actors in the ecosystem are identified: entrepreneurial lead users who aim to start their own businesses, a vibrant user community, and the LEGO company as the focal producer firm and facilitator for multiple user-to-user and user-to-producer interactions. Our study reveals three kinds of synergies: (1) reduced risk for entrepreneurial lead users and the focal producer firm, (2) the extension of the design space of the focal producer firm's products, and (3) the creation of buzz within the user community. Finally, the theoretical and managerial implications of our findings for innovation researchers and practitioners are discussed.

Introduction

There is rich empirical evidence that the locus of innovation is increasingly shifting from producer firms toward users of products and technologies, i.e., that innovation is becoming increasingly democratized (von Hippel, 2005). This shift has been accelerated by new information and communication technologies that allow users to share information and knowledge at low cost. At the same time, scholars and practitioners alike have developed a comprehensive set of methods that allow producer firms to leverage the creativity of users for their new product development efforts. Such methods include the lead user approach (Lüthje and Herstatt, 2004; von Hippel, 1986), firm-hosted user communities (Füller, Matzler, and Hoppe, 2008; Schau, Muñiz, and Arnould, 2009), and toolkits for mass customization and user design (von Hippel, 2001).

While each of those methods has its specific strengths, it also has specific limitations. For example, the lead user approach bears the potential to generate breakthrough innovations (Lilien, Morrison, Searls, Sonnack, and von Hippel, 2002), yet it falls short of creating sustainable producer–user interaction. After all, the collaboration between the focal producer firm and its lead users ends with concept development at the lead user workshop. In contrast, the toolkit approach facilitated by mass customization platforms allows a more sustainable producer–user relationship, yet it is limited in its potential to create truly innovative solutions due to constrained solution spaces (Ogawa and Piller, 2006). Finally, firm-hosted communities allow producer firms to leverage the knowledge diversity of a large number of users for their new product development efforts. This approach, however, is cost-intensive, and it remains difficult to "manage" a user community in the interest of the focal producer firm (Kozinets, 1999).

Research on user innovation has—to a large extent—evolved within fragmented fields, including lead user research, research on user communities, and research on mass customization and toolkits. For example, the most comprehensive summary of user innovation research, von Hippel's *Democratizing Innovation* (2005), is organized in chapters on these streams. Even today, the research map still looks rather fragmented (Bogers, Afuah, and Bastian, 2010). Corporate practice predominantly seems to follow the fragmentation into these different methods.

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Some pioneering firms, however, are experimenting with the creation of sustainable producer–user ecosystems that go far beyond the isolated application of specific methods. In this paper, the functioning of such ecosystems is studied with particular emphasis on the synergies that they can yield. Insights into this question are important in order to advance our understanding of how firms can transform the input of users into a *continuous* stream of successful new products and services, i.e., to create successful business ecosystems centered on users' innovative contributions. Our research therefore integrates two major trends and debates in management literature and practice: the shift from the vertically integrated firm toward open business ecosystems involving a large number of actors (Adner and Kapoor, 2010; Fjeldstad, Snow, Miles, and Lettl, 2012; Iansiti and Levien, 2004; Jacobides, 2005) and the shift from closed and producer-centered toward open and user-centered innovation processes (Chesbrough, 2003; von Hippel, 2005).

The empirical setting of our study is the LEGO company and its various user communities. LEGO is a well-known pioneering firm that is constantly experimenting with new ways of collaborating with its fan and customer base, and the company recently began to allow certain individuals to use the LEGO brand to start up new companies. An explorative, longitudinal, and multiple case study design is used to identify patterns regarding synergies among the focal producer firm LEGO, lead users, and user communities.

The remainder of this paper is organized as follows: In the next section, we provide a review of literature relevant to this research and develop our preliminary theoretical framework. In the following section, we describe our research methodology, after which we present the findings of our study. Finally, we discuss the implications of our research for theory and managerial practice.

BIOGRAPHICAL SKETCHES

Dr. Christoph Hienerth leads the Chair in Entrepreneurship and New Business Development at WHU—Otto Beisheim School of Management. He holds a doctoral degree and Venia Docendi (Habilitation) from the Vienna University of Economics and Business. From 2006 to 2012 he held a tenured position as Associate Professor at Copenhagen Business School, Department for Innovation and Organizational Economics. He is working on the commercialization of innovations and the development of new industries based on user innovations. In particular his research interests are entrepreneurial aspects of very early stages of innovation and new product development, dealing with the recognition and exploitation of opportunities and the role of lead users in these early stages. Professor Hienerth has gained expertise in corporate entrepreneurship through several industry projects with international companies such as Schindler, Deutsche Telekom, Palfinger, Bayer, MAN, LEGO, Fujitsu, Siemens VDO, SAS, Grundfos and Coloplast.

Dr. Christopher Lettl is a professor of entrepreneurship and innovation at the Department of Strategic Management and Innovation at the WU Vienna University of Economics and Business. He holds a doctoral degree from the Hamburg University of Technology and a Venia Legendi (Habilitation) from the Berlin University of Technology. Focusing on collaborative and user-based innovation, his particular research interests include new organizational forms for innovation and entrepreneurship, the emergence of lead users, the role of user inventions for technological progress, and the role of informal and formal structures in multi-institutional development collaborations. He has served as academic advisor for the G8-G5 Heiligendamm ProcessWorking Group on Innovation and Intellectual Property Rights and for companies like IBM, LEGO, Johnson & Johnson, and Coloplast.

Dr. Peter Keinz is an assistant professor at the Institute for Entrepreneurship and Innovation at the WU Vienna University of Economics and Business. As a member of the User Innovation Research Initiative Vienna, he mainly focuses his research efforts on user innovation and open innovation. More specifically, he works on methods to foster and manage corporate new product development activities as well as technology and know-how transfer. Furthermore, he is interested in the strategic and organizational implications for companies when pursuing open and user innovation strategies. He has performed several innovation management projects with companies and organizations like Magna, IBM, OMV, CERN, and ESA.

Literature Review and Framework

In this section, streams of literature are reviewed that are of major relevance to our study, namely lead user research, research on user communities, and research on toolkits for mass customization. Focus is put on the core strengths of the respective approaches as well as their main limitations, thus creating a foundation for our preliminary theoretical framework.

Lead Users as a Source of Breakthrough Innovations

Users of products and technologies have been identified as an important source of innovation in many different industries, such as medical equipment, sporting equipment, scientific instruments, computer games, musical instruments, and IT solutions (Baldwin, Hienerth, and von Hippel, 2006; Franke and von Hippel, 2003; Herstatt and von Hippel, 1992; Jeppesen and Frederiksen, 2006; Lettl, Herstatt, and Gemuenden, 2006; Lüthje and Herstatt, 2004; Morrison, Roberts, and von Hippel, 2000; Urban and von Hippel, 1988; von Hippel 1986, 2005). Users innovate because their needs are not adequately met by the existing products offered by incumbent firms (von Hippel, 1998, 2005). Some users—known as lead users—have demonstrated the ability to develop truly novel solutions with high commercial attractiveness (Franke, von Hippel, and Schreier, 2006).

Lead users' innovative activities have been attributed to two basic characteristics: their leading-edge position with regard to an important market trend and their high expected benefit from an innovation (von Hippel 1986, 2005; Morrison et al., 2000; Urban and von Hippel, 1988). First, lead users face certain needs months or even years earlier than the mass market (trend leadership). Second, lead users derive high benefit from a solution to their needs and are therefore highly motivated to engage in innovative activities (high expected benefit). Lead users develop novel solutions at a point in time when markets are still small and uncertain. Due to their trend leadership position, however, their innovations become attractive to large market segments after a certain time lag along the diffusion curve (von Hippel, 1986). The commercial potential of lead user innovations has been utilized in lead user projects and was tested in the well-known 3M study (Lilien et al., 2002).

The literature dealing with lead user innovations reveals two types of topics and/or results: First, studies have dealt with the lead user method and the results generated by various lead user projects (Herstatt and von Hippel, 1992; Lilien et al., 2002; Lüthje and Herstatt, 2004; Urban and von Hippel, 1988). Second, studies have dealt with operationalizing and testing lead user characteristics in various industries (Franke and von Hippel, 2003; Franke et al., 2006), as well as looking at the adoption and diffusion of lead user innovations (Schreier, Oberhauser, and Prügl, 2007).

The limitations of the lead user approach are its high potential risk (e.g., that no trend can be identified, that no lead users can be identified, or that the wrong individuals or firms are identified as lead users). Furthermore, the lead user approach does not generate a sustainable relationship between the focal producer firm, meaning that the lead users' concepts can fall victim to the "not invented here" syndrome. Finally, the lead user method faces the challenge of fairness with respect to the resulting intellectual property rights.

User Communities

Prior research shows that innovative users frequently share their innovative thoughts and artifacts with their peer community, and that innovative users sometimes receive significant support from the peer community in the new product development process (Baldwin et al., 2006; Franke and Shah, 2003; Franke and von Hippel, 2003; Hienerth and Lettl, 2011; Jeppesen and Frederiksen, 2006). User communities facilitate not only the sharing of knowledge but also its accumulation, reuse, and recombination (Brown and Duguid, 1991; Murray and O'Mahony, 2007; von Hippel, 2007). In contrast to hierarchies or other forms of networks, exchange processes between members in user communities are not based on formal contracts but on "relational contracts" in the form of trust, shared norms and values, as well as general reciprocity (Demil and Lecocq, 2006; O'Mahony and Ferraro, 2007).

From an innovation perspective, the community-based model of knowledge creation has three major strengths. First, peer communities facilitate diversity, as problems can be viewed from many different angles and a broad set of knowledge can be used to develop solutions (Terwiesch and Xu, 2008). Second, with their inherent peer-review system, these communities enable accumulative innovation, i.e., building on the solutions of others (Murray and O'Mahony, 2007). Third, peer communities provide a setting for the identification of attractive ideas and for the effective identification of flaws. As Raymond (1999) puts it in his well-known quote: "Given enough eyeballs, all bugs are shallow." Prior research has already revealed that user communities are a vibrant arena for innovation and sometimes even a fruitful basis for new firm creation (Baldwin et al., 2006; Franke and Shah, 2003; Hienerth, 2006; Shah and Tripsas, 2007). Specifically, community members have been shown to provide significant support for entrepreneurial lead users in the process of setting up new firms by contributing market feedback, technical know-how, and physical resources (e.g., testing equipment), and by serving as a source of first sales (Hienerth and Lettl, 2011; Shah and Tripsas, 2007).

One specific kind of a user community is one that centers on the brand of a focal producer firm. Muñiz and O'Guinn (2001) define a brand community as "a specialized, non-geographically bound community, based on a structured set of social relationships among admirers of a brand." Brand communities are composed of individuals who identify socially with other individuals who share their interest in a particular brand (Algesheimer, Dholakia, and Herrmann, 2005; McAlexander, Schouten, and Koenig, 2002). This phenomenon encompasses a wide range of products, including cars, motorcycles, computers, television series, movies, soft drinks, and even car tires (Algesheimer et al., 2005; Brown, Sherry, and Kozinets, 2003; Kozinets, 2001; McAlexander et al., 2002; Muñiz and O'Guinn, 2001; Schau et al., 2009; Schouten and McAlexander, 1995). One key characteristic of brand communities is openness of membership (Muñiz and O'Guinn, 2001). Research on brand communities has dealt with the nature of such communities

(Algesheimer et al., 2005; Granitz and Ward, 1996; McAlexander et al., 2002; Muñiz and O'Guinn, 2001; Muñiz and Schau, 2005), their impact on brand loyalty (Algesheimer et al., 2005; McAlexander et al., 2002; Scarpi, 2010; Thompson and Sinha, 2008), as well as the motives and effects of co-creation processes between the community and a focal producer firm (Franke and Piller, 2004; Füller et al., 2008; Kim, Bae, and Kang, 2008; Sawhney, Verona, and Prandelli, 2005).

Despite the core benefits mentioned above, user communities also contain a range of limitations and disadvantages for the focal producer firm. User communities and the corresponding user-generated content precipitate a loss of control on the part of the producer firm with respect to the new product development process as well as branding. Furthermore, difficulties arise in aligning the creative activities of the community with the producer firm's strategy, as well as in maintaining fairness perceptions in the community with respect to the commercialization of intellectual property that it produces (Franke et al., 2013). Furthermore, communities and new firms created by lead users who are embedded in those communities can be a major source of competition for incumbent producer firms (Baldwin et al., 2006; Hienerth, 2006).

Mass Customization Toolkits

The toolkit approach constitutes an invitation to users to create their own tailored solutions. The locus of problem-solving thus shifts from the producer firm to the user (Thomke and von Hippel, 2002; von Hippel 2005; von Hippel and Katz, 2002). While the toolkit approach was first applied in the semiconductor industry (Thomke and von Hippel, 2002) and the computer games industry (Jeppesen and Molin, 2003; Prügl and Schreier, 2006), it is now used in many different fields, including toys, foods, and financial services. Empirical research has shown that the users' willingness to pay increases substantially if they are allowed to design their own solutions and/or products (Franke and Piller, 2004; Schreier, 2006).

Toolkits facilitated by mass customization platforms only allow users to "design" their own products within a closed solution space which is predefined and controlled by the producer firm. Similar to a morphological box, a selection of different characteristics is provided for each product dimension (e.g., blue, red, or green). Users can then choose the preferred characteristic for each product dimension and thus configure their own products. Mass customization is driven by four main structural changes in today's economy: heterogeneous demand, short product life cycles, mature markets, and more conscious consumers (Bardakci and Whitelock, 2003). Where technological preconditions such as flexible manufacturing and two-way communication systems are in place, technology can serve needs efficiently, even on an individual level (Bardakci and Whitelock, 2003).

At the same time, three main challenges of the mass customization approach are the costs in comparison to mass-produced products, the inability to deliver goods to the customer at the time of purchase, and the time that the customer needs to design the desired product. A number of industry leaders—including Toyota, Dow Jones, and Motorola—have tried to employ mass customization but have experienced a number of difficulties. For example, Toyota underestimated the increased complexity of its plan to deliver custom-made cars in a timely manner (Pine, Victor, and Boynton, 1993). In recent years, several companies such as Nike and Apple have successfully implemented mass customization. However, both the space for creativity and the share of total revenue generated by mass customization remain small (Ogawa and Piller, 2006). This might be due to the fact that these applications basically require companies to produce and supply any combination of the elements offered. Any decisions regarding variations or creativity are made upfront by the company, and this usually results in offers which are limited in terms of variety and novelty.

Research has also shown that there are at least three positive synergies between a toolkit and a user community (Franke, Keinz, and Schreier, 2008). First, a community provides a forum where skilled user-designers can show off their talent and thus benefit from peer recognition. Second, user-designers receive valuable input from the community to enhance their designs. Third, community members may develop the toolkit further.

On the basis of this literature review and the work of Baldwin and von Hippel (2011), the following framework is used for the empirical investigation: Within an overall setting, three actors—the focal producer firm, individual lead users, and user communities—coexist and are able to contribute to the development of innovations. The empirical data in our study allow us to analyze the synergies among these three actors in the course of exploring and exploiting business opportunities. As these processes are complex and multifaceted, a case study approach is used, as described in the next section.

Research Approach

Due to page restrictions and a focus on the results of the analysis, this paper contains only a brief overview of the methodological approach. A comprehensive presentation

of the research approach including the full description of the *empirical setting*, *the selection of cases*, *data collection and triangulation*, *data reduction and verification*, as well as tables and references to cases is provided in an online technical appendix (http://bit.ly/sapfluauc).

Case Study Design

Only limited literature is available on the joint activities of lead users within user communities and producer firms. The same observation holds for the aspect of entrepreneurship, when lead users and well-known producer firms cooperate in order to start up a new business, involving user communities for certain functions in the process. Therefore, exploratory questions form the motive underlying our study and analysis. Insights on these questions will enable us to better understand what specifically happens, what these processes look like and how they function, and which actors are involved in what kinds of activities—on the part of the lead user, the user community, and the focal producer firm. For these types of questions, the literature suggests the case study method, as it enables researchers to investigate causes and relationships in greater detail and over a longer period of time (Eisenhardt, 1989; Gillham, 2000). It also makes it possible to integrate the viewpoints of different actors within a certain field and allows for alternative explanations of a specific phenomenon. As a result, the case study method has been applied in fields such as new technological opportunities (O'Connor, 1998; Song and Montoya-Weiss, 1998) and the existing research on brand communities mentioned above (Muñiz and O'Guinn, 2001). In this paper, the case study method specifically allows us to use varied and rich sources of data (e.g., interviews, on-site visits and participatory observation, web pages, reports, articles, etc.), and to interview and analyze specific persons and situations repeatedly in order to generate new insights for research on an overall system of lead users, the user community, and the focal producer firm. This approach will allow us to develop novel insights as a basis for further studies.

Selection of Empirical Setting and Selection of Cases

Theoretical sampling (Eisenhardt, 1989, 1991) was applied in the choice of the overall setting as well as the selection of main and complementary cases. With regard to the more general choice of setting, the theoretical framework of innovative actors as presented in the literature review section is used, referring also to the literature on user communities, lead users, and entrepreneurship. LEGO is chosen as the major research object as this well-established producer firm can be regarded as a pioneer with respect to running a highly vivid producer–user ecosystem. This ecosystem has evolved over many years and includes a large number of lead users (who partly started their own businesses) and user communities that frequently interact with each other. This setting allows us to study the functioning of user–producer ecosystems with a particular emphasis on the synergies that they can yield. A multiple case study design is applied (Eisenhardt and Graebner, 2007; Miles and Huberman, 1994). The selection of cases follows the aspects of matching, extension, and contradiction (Eisenhardt, 1991; Yin, 1994) via theoretical sampling. We first selected four main cases that match the core framework and research question presented above. These cases feature individuals who have started up their own businesses with some form of connection to the LEGO brand and products. For the purpose of contradiction, we selected a case that contravenes the values of LEGO and its core community to the extreme. The company in question specializes in original, custom-designed LEGO-compatible weapons and war minifigures (or minifigs) and has therefore stirred numerous controversies in the core LEGO community. As for the extension of cases, we specifically selected five complementary cases, looking at variations in the product, type of community, and the development steps regarding formal cooperation with LEGO. The inclusion of multiple cases within this setting allows us to compare the emergence of different business models from the user community, the different pathways taken by individuals in the development process, and the different actions taken by the focal producer firm. Furthermore, the use of multiple cases serves to reduce bias from single sources (Podsakoff, MacKenzie, Jeong-Yeon, and Podsakoff, 2003).

Data Collection and Triangulation

Case study research has been criticized for different forms of bias and subjectivity relating to the use and interpretation of data (Chetty, 1996; Perry, 1998). In order to reduce such sources of bias, various types of data were collected at different stages of this study. We applied triangulation using data combined from different sources and matched in order to gain a more complete and objective picture of the respective phenomenon and subject of analysis (Amaratunga and Baldry, 2001; Maxwell, 1996). Over a five-year period we conducted 82 interviews, had 12 days of on-site visits, conducted four workshops at

LEGO and two coding workshops. We furthermore processed secondary data (data from Web sites, magazines, scientific journals, company reports, and industry databases) and data available in online forums regarding the LEGO cases selected. The detailed timing, use of data, and triangulation strategy can be found in the comprehensive online version of the research approach.

Data Reduction and Verification

In order to reduce the quantity of data collected and to enable comparison of the cases studied, the following data reduction process was applied (Miles and Huberman, 1994). The coding included three major steps: In a first step, we drew on literature to identify major categories. In a second step, 17 codes were identified within those categories resulting in eight patterns reflecting prior empirical findings. Here, we focused on bilateral interactions between actors. In the third step, synergetic interactions among the focal producer firm, the user communities, and the lead users were identified. Assisted by two independent coders, 16 new codes were discovered resulting in three new synergetic patterns. The coding was based on 1278 references to the data. The measure for reliability using Krippendorff's alpha resulted in high agreement (.87; values above .80 are generally considered highly reliable, e.g., see Hayes and Krippendorff, 2007). After completing our preliminary case analysis, pattern matching, and conclusions, the findings were presented to the interviewees in order to correct for alternative explanations and to perform a final validation.

Findings

The findings section first provides some background on the development of LEGO and its experiences with the user community and lead users within that community. Then, the main cases and complementary cases are briefly presented. The description of identified patterns across the cases with regard to our research question is then divided into two main parts: First, patterns that confirm existing theory on the benefits arising from bilateral interactions between the different actors in user innovation ecosystems are presented. Based on those first eight patterns and additional codes, three novel patterns are presented. These patterns reflect synergy effects that occur only through the contribution of all actors in the ecosystem and thus go beyond prior empirical findings.

Background: The LEGO Mindstorms Experience

As a family-owned company, LEGO started out with and maintained a traditional innovation strategy based on internal research and development, professional designers, and a strong emphasis on protecting and controlling its brand and intellectual property. This innovation strategy of "LEGO developed, LEGO published" came under severe attack when LEGO launched a radically new toy called LEGO Mindstorms in 1998. Mindstorms is a brick robot which has a computer "brain," a stepper motor for movement, and different types of sensors (e.g., light, touch, temperature). A few weeks after the original Mindstorms market launch, a Stanford graduate student named Kekoa Proudfoot reverse-engineered the robot and posted all of his findings, including detailed information on the robot's underlying software, online. Several other engineers quickly used Proudfoot's insights to design their own Mindstorms tools, including an open source operating system. For almost a year, LEGO's executive team seemed almost paralyzed by this new experience. As one LEGO executive put it, "We simply did not know what to do." Moreover, one hacker noted, "There was almost a full year without a word from LEGO: Neither acknowledgement of what was going on nor threats towards the hackers." Finally, LEGO decided to let the hackers flourish; it even wrote a "right to hack" into the Mindstorms software license, giving fans explicit permission to invent new features and functions. Soon, dozens of Web sites were hosting third-party programs that helped Mindstorms users build robots that LEGO had never thought of: soda machines, blackjack dealers, even toilet scrubbers. Hardware mavens designed sensors that were far more sophisticated than the touch and light sensors included in the factory kit. More than 40 Mindstorms handbooks provided step-by-step strategies for tweaking the performance of the robot kit. LEGO's decision to democratize the development of Mindstorms was a natural extension of its efforts over the past few years to connect customers to the company. On LEGO's Web site, for example, fans can purchase sets that are available exclusively online and sign up for LEGO's Internet club. For those looking to express their creativity even further, the company introduced LEGO Factory, a customization program that allowed users to design, upload, and purchase their own unique LEGO creations. The toolkit used for this purpose, called L-Draw, was developed by an enthusiastic fan himself. Since the launch of LEGO Factory, the company has experimented with several web 2.0 tools to create a closer link to its enthusiastic fan base. LEGO learned a great deal from the

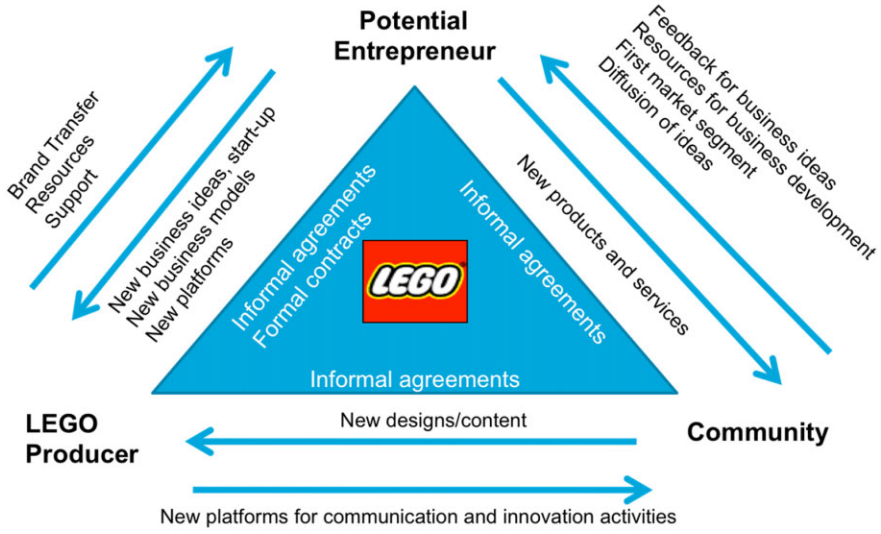


Figure 1. The Symbiotic System of the LEGO Company, Lead Users as Potential Entrepreneurs, and the User Community

Mindstorms experience, including the strategy of identifying and collaborating with its lead users more proactively. Those lead users contributed substantially to the next-generation Mindstorms kit. Their love and passion for LEGO as well as the fun of developing novel designs turned out to be the lead users' main motives for devoting a large amount of time and energy to LEGO development efforts. After all, the lead users are compensated with LEGO bricks, not money (Koerner, 2006). Based on its experience with Mindstorms, LEGO began to experiment with different forms of collaboration with its community of users and individual lead users. This setting and the resulting bilateral exchange processes are depicted in Figure 1.

One outcome of this process is that several lead users have successfully started up their own ventures in some form of cooperation with LEGO. In the following, those cases are described and analyzed.

Main Cases (MCs)

Adam Reed Tucker and Brickstructures (MC1)

In Northbrook, Illinois, Adam Reed Tucker has set up a studio that houses an astonishing number of LEGO bricks (easily more than 10 million) of all shapes and sizes. Originally influenced by Chicago's iconic skyline and the tragedy of 9/11, he has created a unique professional career by innovatively combining his passion for architecture with his enthusiasm for the infinite tactile construction possibilities of LEGO bricks. His case is "[a] LEGO-based educational platform emphasizing the studies of Architecture, Engineering and Construction" (http://www.brickworld.us/chicago/view/bios/).

Joe Meno and BrickJournal *(MC2)*

"After getting the raw stories and photos, it's a challenge to work things out to a page design. But when it happens, it's almost magic," says Joe Meno, originator and editor of *BrickJournal*, the leading publication devoted to the plethora of activities, personalities, and ideas emanating from the global adult fans of LEGO (AFOL) community. Today, the strong and ever-increasing viability of his innovative LEGO-based business venture marks the successful completion of a radical career change that was triggered by the very same community. His case is a dedicated LEGO fanzine in addition to the official *LEGO Club Magazine*.

Robin Sather and BrickVille Design Works (MC3)

Forty years after Apollo 11 Mission Commander Neil Alden Armstrong set foot on the moon, the exhibition *Wheels, Wings & Waves: A LEGO World of Transportation* had its world premiere on January 30 at TELUS World of Science in Vancouver, Canada. On its opening weekend, renowned LEGO builder Robin Sather joined forces with museum visitors to create a nine-foot LEGO replica Space Shuttle on the spot. Furthermore, he created the exhibition's spectacular centerpiece, a massive diorama 2.5 meters across and 2 meters tall displaying all kinds of transportation vehicles and machines using only LEGO bricks and minifigures. For Sather, this marked the

completion of yet another project. His entrepreneurial venture BrickVille DesignWorks was launched in the spring of 2004 "with the goal of using LEGO® bricks and products to produce events, displays, exhibits, and custom creations," as he explains on the company's Web site (http://www.brickville.ca/aboutus.htm).

Duncan Titmarsh and Bright Bricks (MC4)

"Nothing's more memorable than a larger-than-life LEGO® commission!" says the Web site of Bright Bricks, a company dedicated to providing professional LEGO building services to a wide range of customers. For example, Bright Bricks supports corporate brand promotion campaigns by building customized artifacts made entirely of LEGO bricks. Bright Bricks was founded in the U.K. by Duncan Titmarsh, more or less accidentally as there was no initial plan to start up a company. Duncan Titmarsh had been known as a LEGO enthusiast among the LEGO community for many years. One day, BBC Radio—his first "client"—asked him to build a replica of the BBC studio. Around that time, Duncan Titmarsh started to think about turning his capabilities into a business. He founded his company and became an official LEGO Certified Professional in the U.K. Today, he employs other fellows from the AFOL community to build models for his clients.

Complementary Cases (CCs)

Will Chapman and BrickArms LLC (CC1)

Specific Aspect: Incompatibility of New Venture with LEGO Brand and Values. BrickArms LLC is a community-based and community-targeted business initiative that has spawned substantial controversy in AFOL circles as well as the general public. According to its Web site, http://www.brickarms.com,"BrickArms LLC is a small toy company specializing in original, custom designed LEGO-compatible [*sic*] weapons and custom minifigs. All toys are original, and we produce high quality, low cost toys that 'fit' perfectly with the LEGO-Universe."

Marcos Wesley and LEGO ZOOM International (CC2)

Specific Aspect: Tapping into a Different Community. In 1980, The LEGO Group established LEGO Education, a division aiming to provide "complete learning solutions that cover a variety of curriculum areas, while encouraging children to use their creative, problem-solving and team-working skills." Consisting of activity packs, teacher guides, etc., these brick-based educational kits soon enjoyed conspicuous success in most of the world, but they did not catch on in Brazil until later. Around 2000, the Brazilian distributor, EDAcom Tecnologia had difficulties getting through to the domestic market. A closer look at the teaching resources required by local schools revealed that the curricula almost exclusively required books of various kinds. That insight led Marcos Wesley, General Manager of EDAcom Tecnologia, to develop his own LEGO-based didactic material to sell to the schools in combination with the existing LEGO educational sets.

Tommy Armstrong and The Brickengraver (CC3)

Specific Aspect: Failure to Establish Formal Cooperation with LEGO. Known as "The Original Brick Engraver," Lillington, North Carolina resident Tommy Armstrong has created a fruitful business niche that provides the most discerning of his fellow AFOLs worldwide with LEGO accessories and add-ons tailored to their individual requests, primarily in the form of custom-made brick engravings on tiles and minifigs.

Eric Olson, Mike Fetsko, and MeModels (CC4)

Specific Aspect: Early Process of Developing Formal Cooperation with LEGO. MeModels is a company that creates and sells custom LEGO designs. Cofounded by Eric Olson and Mike Fetsko in 2003, the firm has become well known among LEGO fans. One of their latest products is a 9-volt conductive train track developed in response to many LEGO train fans' requests, thus further enhancing the company's reputation. Although no formal relationship has been established with the LEGO company, MeModels is not unknown to LEGO. As Eric Olson puts it: "At this point, they know we are here and we know they are there. That's kind of where it is. We do end up having some good discussions with them from time to time; obviously they send a delegation to each one of the shows and they always stop by and talk to us to find out about how things are going."

Amir Asor and Young Engineers (CC5)

Specific Aspect: No Initial Steps Taken toward Formal Cooperation with LEGO. Young Engineers is a fast-growing business that was initiated by Amir Asor. It currently employs 20 people and was the winner of the Youth

Table 1. User Innovation Approaches: Actors, Benefits, and Limitations

Actors and User Innovation Approach	Core Benefits	Limitations/Disadvantage	Literature
Producer firm—lead user	Potential for breakthrough innovations	— No sustainable producer–user interaction — "Not invented here" syndrome after lead user workshop — High risk for producer firm — IP issues	Herstatt and von Hippel (1992), Urban and von Hippel (1988), Lilien et al. (2002), Olson and Bakke (2001)
Producer firm—user community	— Diversity of knowledge for problem solving (Linus' law) — Knowledge accumulation — User-to-user assistance — Unpaid marketing efforts (e.g., brand community) — Recruitment of lead users from community	— Loss of control — Difficulties channeling creative activities of communities toward the producer firm — IP issues — Cost-intensive	Franke and Shah (2003), Dahlander and Wallin (2006), Füller et al. (2008), Schau et al. (2009), Poetz and Prügl (2010)
Lead user—user community	— Development of novel ideas/ topics by lead user — Community providing support for entrepreneurial lead users (feedback, technical knowledge, physical resources, first sales)	— High entrepreneurial risk for lead user — Lead user firm as competitor (→threat to incumbent producer firm) — Community as complementary asset for lead user firm (→threat to incumbent producer firm)	Hienerth (2006), Baldwin et al. (2006), Shah and Tripsas (2007), Hienerth and Lettl (2011)
Producer firm—mass customization/toolkits	— Continuous producer–user interaction — Increased preference fit — Increased willingness to pay	— Constrained creativity of users — Marginal degree of innovativeness — Cost-intensive	von Hippel (2001), von Hippel and Katz (2002), Franke and Schreier (2008), Franke, Keinz, and Steger (2009), Franke, Schreier, and Kaiser (2010), Franke and Schreier (2010)
Mass customization/ toolkit—user community	— Peer recognition for user-generated designs as value driver — Peer input increases user self-design — Community develops toolkit further	— Constrained creativity of users — Marginal degree of innovativeness — Cost-intensive	Franke et al. (2008)

Business International Entrepreneur of the Year competition 2011. The purpose of the project is to help children overcome learning difficulties and understand complex physics and mathematics by equipping them with self-designed, special LEGO educational sets. These sets enable children to build models demonstrating a certain scientific principle, e.g., a carousel. Young Engineers is not yet associated with the LEGO company, but Amir Asor is aware of the potential advantages of a future cooperation with LEGO.

Günther Hölzl and Mindroid (CC6)

Specific Aspect: Open Source-Based Idea not Primarily Targeted at Commercialization. Mindroid is a very special case, as it refers to an open-source project that was initiated by Austrian teacher Günther Hölzl. The original idea was to design an application for mobile phones enabling users to control LEGO Mindstorm robots. Hölzl wanted to make use of his invention for his own educational purposes. After having published his work via Youtube and his Web site, he was contacted by LEGO and asked to further develop this idea. Hölzl and LEGO agreed to design the project as an open-source project, which ended in a major success and high awareness within the community.

Patterns confirming prior empirical findings (repetitive patterns). Patterns identified and confirming existing theory in main and complementary cases are summarized in the online appendix (Table IV). A comparison of Table IV (online appendix) and the literature summarized in Table 1 reveals that the patterns confirm existing findings about (1) lead users and their way of

innovating (patterns 1, 2, 3 and 4), (2) community activities and user-to-user assistance in the innovation process (patterns 5 and 6), and (3) the role of the producer firm and the platform for innovation they provide for the user community (patterns 7 and 8).

With regard to the findings related to lead users and their way of innovating, the cases confirm that lead users build up extensive in-depth knowledge within their respective areas of expertise (pattern 1). They also accumulate knowledge and experience with regard to the focal producer firm's field of activity. All cases show a long history of involvement in LEGO-related products and activities (pattern 2). Furthermore, lead users are the first to innovate within the new field (pattern 3) and develop further activities to expand their ideas and businesses on the basis of initial investments and commitment (pattern 4). While these patterns have already been observed in prior studies, we also derive additional insights that point to synergies with the two other types of actors/domains, namely the user community and the focal producer firm: Lead users not only build up their own knowledge and experience, but they also bridge knowledge and experience from the user community and the focal producer firm. They observe and collect specific needs and opportunities from the focal producer firm and the community and integrate them into their new business ideas. Furthermore, we see that apart from their own needs and interests, lead users are also motivated by commercial rewards from the focal producer firm and the user community. In contrast to existing studies on user entrepreneurship and user manufacturing where commercialization is one of the final stages of development, our cases show that commercial motives play an important role in the early stages of developing innovative business ideas. Thus, the exploration of new design spaces not only follows the individual decisions and interests of the lead users but is also a consequence of reactions on the part of the community and the focal producer firm as well as the repeated expansion of the lead users' ideas and businesses in response to specific demand.

As for the findings related to the user community, the cases confirm that users from the community support the lead users in their innovative activities with knowledge as well as tangible resources and participation. Furthermore, in the cases analyzed here, users from the community again become the first market segment. What can be discovered in addition to existing findings is that community members take on the role of ambassadors and help build legitimacy for the lead users and their business ideas. Thus, in the lead user/community/focal producer firm system, the focal producer firm's strategy and decision with regard to cooperation with a lead user can be influenced heavily by open discussion and information about the lead user's ideas and progress from within the user community. Furthermore, our findings show that when new market segments emerge along with the idea and expansion of the new products or services supplied, the lead users become catalysts and process designers for the market development, acting in the interest of the focal producer firm even when no formal contract or agreement has been reached.

With regard to the findings related to the focal producer firm, our cases confirm that electronic tools assist the process of integrating external users' ideas into the new product development funnel and that the focal producer firm uses different means to further involve and foster lead users and their business ideas. Our cases show three emerging company strategies on how to deal with radical external ideas: promoting, ignoring, and fighting. Those strategies function as signals to the overall user community: Even if not formalized, cooperation with specific lead users and their business ideas provides motivation for further idea and business developments that comply with LEGO's norms. Finally, the cases show that while electronic tools provide a joint understanding and formally convey the underlying design and company principles, the radical new business ideas emerge outside of that solution space. Thus, the focal producer firm signals opportunities and rewards for lead users to participate in more radical and differentiated new business development.

Patterns with respect to synergies among all three actors. The symbiotic ecosystem outlined above makes it possible to leverage synergies that go beyond those described in the literature (Table 1). We were able to identify three novel patterns from 17 code combinations in a first coding round (interactions of codes from confirming/repetitive patterns) and from 16 novel codes identified in a second coding round (see Table III, online appendix). The three identified patterns that reflect these synergies are (1) risk reduction, (2) design space extension, and (3) creation of buzz. In the next section, the respective patterns are described. Furthermore, each novel pattern is shown in a figure in order to illustrate the interlocking elements of each form of synergy.

Risk Reduction

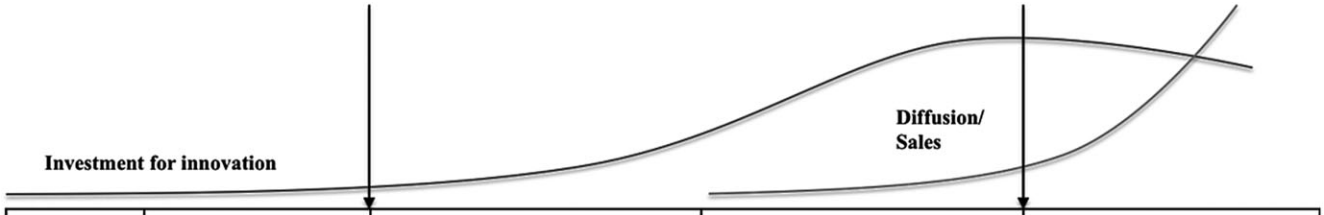
The synergy of reduced risk arising from the exchange relationships among the LEGO company, the lead users, and the user community is well illustrated by the follow-

ing exemplary quotes of a LEGO New Business Development Manager and a lead user:

> *The start-ups of our fans benefit a lot from our strong brand—it simply gives them credibility and goodwill in the marketplace. And let's not forget: they can use our expertise and distribution channels and sometimes also venture capital! . . . [and] then we also monitor blogs and reactions in the various communities, which is always a good indication of whether there is a viable market segment out there. (Tormod Askildsen, LEGO New Business Development)*

> *Sailing under the LEGO brand really helps a great deal—it's a huge difference whether you venture as Joe Meno or as LEGO BrickJournal! . . . LEGO provided me with one year's funding, which was really crucial at that stage, and they paid my salary. . . . Also the community is pretty straight in telling you what they like and dislike about your idea. . . . The debut issue was downloaded about 100,000 times—it completely blew everybody away. Since then I knew that the venture would survive. (Joe Meno, Lead User, MC2)*

Description of the pattern. One of the key characteristics of the symbiotic ecosystem observed is that risks usually carried by a single actor are distributed among all participating actors. As illustrated in Figure 2, typical risks emerge in different development phases of entrepreneurial activities, from initial idea development to idea selection, and on to codevelopment of the venture and finally the initial launch of products on the market. Information from the cases contribute to our understanding of how these risks are reduced through the interplay of the actors in the user innovation ecosystem (see "Risk reduction" in Figure 2). Risk reduction is achieved by two different mechanisms. First, as risks are distributed among the contributing actors, the level of risk for each individual actor decreases. Thus, with rather fixed risk-taking thresholds on the part of the participating actors, a synergetic ecosystem can incentivize entrepreneurial activities by reducing individual risk, while the overall level of risk remains the same. For instance, when individual lead users have already invested resources in idea development, the focal producer firm does not have to



Stage	Idea development	Selection	Co-development	Introduction
Risk taker	- Lead User	- Producer firm	- Lead User - Producer firm	- Lead User - Producer firm
Risk	- Development risk	- Selection risk concerning idea (false negative, false positive) - Selection risk concerning entrepreneur (false negative, false positive)	- Market risk (both) - Financial risk (both) - Branding risk (producer firm) - Liabilities of newness (lead user) - Liabilities of smallness (lead user)	- Market risk (both) - Financial risk (both) - Branding risk (producer firm) - Liabilities of newness (lead user) - Liabilities of smallness (lead user)
Risk reduction	- Community as resource provider and feedback provider	Community as feedback provider →Market sensing for producer firm - Upfront investments by lead users → self-selection of committed individuals - Observation of lead users' behavior and business conduct (e.g., interaction with community and other stakeholders) via a longer period of time ("real life-assessment center")	*For lead user:* - Brand transfer - Complementary assets of producer firm - Community as resource provider and feedback provider *For producer firm:* - Large upfront investments by lead users - Large number of lead user entrepreneurs	*For lead user:* - Brand transfer - Complementary assets of producer firm - Community as ambassador and first market *For producer firm:* - Large upfront investments by lead users - Large number of lead user entrepreneurs - Spillover into segments outside community

Figure 2. Synergy: Risk Reduction

bear all of the development costs or invest in a broad variety of options. Instead, it can observe alternative options and then invest resources in the further process of developing a cooperation arrangement that is most promising.

For instance, Adam Reed Tucker (MC 1) had been building LEGO architectural models for over three years (2002 to 2005) before he formally started up the new venture Brickstructures. He contributed his architectural knowledge and experience and also invested in several million Lego bricks to experiment with his ideas. When LEGO was confronted with an architectural LEGO kit, the company was already able to evaluate existing prototypes and the first sales of the venture started by the lead user. From the perspective of the individual lead user, once an initial investment is made, additional funds and complementary assets from the focal producer firm (such as marketing, know-how, legal expertise, distribution channels, value of the brand) can provide an incentive for further development (as in the case of Joe Meno, MC2, quoted above). Second, even without assuming risks, participating actors can reduce the usual risk by sharing knowledge and information that is usually not disclosed. Members of the user community can express their opinions about new designs and also vote on or even preorder products or services. For instance, this effect can be illustrated by conversations that were tracked in online forums regarding MeModels (CC5) (posted on Eurobricks.com, August 14, 2011). The user Toastie wrote

> *And: I too would like to thank you for sharing all this information on your new product! This is true customer service and once I have tried the tracks and they work for me (I am convinced they will) I'll may [*sic*] want to order considerable amounts!*

to which a LEGO Ambassador replied

> *I was thinking the same—great to have you on the forum and quickly responding to questions, Eric—it gives me confidence about the product and the company. I hope you're also getting lots of valuable feedback and food for thought from the experts on here.*

Furthermore, online community processes and behavior can be designed and automated so that they do not block human resources or consume too much in terms of financial resources. They reduce the risk of the individual lead user and the company by better anticipating market demand. This synergy is triggered via LEGO's DesignByMe platform, on which individual users and lead users can develop novel ideas and other community members can comment on, further develop, and also order the designs.

Comparing across all cases (based on Table V, online appendix), the strategic alternatives of LEGO regarding risk reduction can be summarized in four different actions: (1) the long-term observation of entrepreneurial activities in order to gain a valid picture of the start-up's potential success, (2) cooperation on project basis, (3) a more formal and long-term cooperation, and (4) pursuing legal actions and active separation from a specific venture not following LEGO's norms (CC1). Interestingly and irrespective of the actual type of collaboration chosen later on in the process, our data show that LEGO usually bases its decisions of how intensively to collaborate with a potential partner on systematic observations of the start-up's standing and success within the user community. The following quotes illustrate this finding that is robust among the cases investigated:

> *They [LEGO] have as we know a number of mechanisms in place within the organization in order to gage the general feelings within the community. One of these programs involves the ambassadors program . . . adult fans who are, I would not say employed but . . . selected by the LEGO organization. . . . They are basically the radar for the organization. They provide feedback to the organization as they get it from other fans . . . they feel what is going on in the community. (Eric Olson, CC4)*

> *But when you apply [for the status as a LEGO Certified Professional], some people already know in the LEGO company, that you do lots of building, and have already fans. (Duncan Titmarsh, MC4)*

From the lead user perspective, the ecosystem around LEGO and the LEGO user community allow risk reduction mainly by reduced development or investment costs as well as an increased likelihood of market success. Again, different levels could be identified. One is that lead users simply draw on the platform and framework provided by LEGO. A second one is price reductions for resources bought from LEGO, and yet another one is joint development and cooperation resulting in transfer of resources from LEGO to the lead user. Interestingly, the second option could be found for the development of novel services while the third one could be found for the development of novel products. In addition, lead users benefit highly from being allowed to put the LEGO brand on their creations. Sailing under the LEGO brand substantially reduces the risk of market failure because of a positive brand equity transfer. Regarding the community

perspective, risk reduction does not relate to investments by community members but rather to the assurance of compliance to quality standards and norms.

Extension of Design Space

The lead users play a crucial role in pushing the boundaries of LEGO's range of products. By customizing bricks and developing entirely new brick designs, the lead users contribute to extending LEGO's design space, as demonstrated by the following quote:

> *As the local distributor, I was frustrated that only children from rich families could afford the LEGO Education sets in Brazil, and I wanted to change that. . . . In May 2002, I went to an education trade show and came up with a new business idea: the schools should get the LEGO material for free, but as part of a holistic business model to stimulate kids so that they can help their own community. . . . By supplying all the teaching material and offering 128 hours of support for free, it was now possible to break through to the schools and ensure recurring sales as well as enlarge the scope of LEGO-based didactic material. (Marcos Wesley, Lead User, CC2)*

Description of the Pattern

LEGO's design space is basically defined and bound by its core products, i.e., bricks. Thus, the most likely way in which the company would extend its design space would usually happen by developing novel designs that contain bricks, probably novel ones that are compatible with existing products. A good example of a design space extension would be a complete police station that contains figures (people), cars, houses, and some additional details. Some of the bricks needed would probably be available from prior products (such as cars or houses), while others would have to be newly designed. As shown in Figure 3, the described extension of the design space remains within a certain range that is not too distant from LEGO's existing offers.

A first extension could be found in the example of novel railway sets developed by LEGO but inspired by lead users. Those railway sets were novel not only in terms of the design itself but also in terms of the number of options the individual packages contained. The lead users had developed a solution that would allow multiple railways within one set of LEGO bricks. However, our cases show further extensions of the design space, again leveraging all actors in the synergetic ecosystem. On the

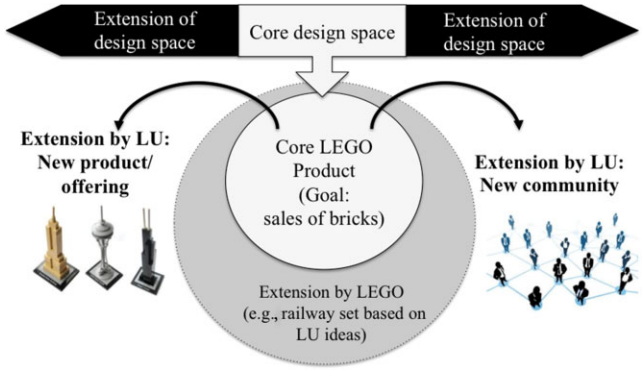


Figure 3. Synergy: Extension of Design Space

left-hand side, the figure shows an extension of the design space based on a completely novel products or solutions. Such cases involved a radical product innovation that could not have been developed within LEGO or that would have required a large amount of resources to realize. A good example of such an extension is the development of the architectural sets of LEGO bricks (MC1). On the right-hand side, the figure shows a different type of extension, namely one toward a new community. Here, the novel ideas enable an extension toward new consumers that would not otherwise have been attracted by LEGO products. The knowledge and experience of the individual lead user and the LEGO products and brand together enable the emergence of a novel community. A good example of this kind of extension is the case of LEGO Zoom International (CC2). This extension functions due to an individual lead user with a specific background and knowledge, the opportunities and resources the company can provide, and the needs and interests of a specific community that are leveraged/satisfied. The statements by Amir Asor (CC5) and Mike Fetsko (CC4) further demonstrate the motives of lead users to extend the LEGO product line substantially:

> *I started because I really wanted to do it. . . . I just saw the kits, the LEGO educational kits and I saw how people are working with it a bit and then I looked on the curriculum that other companies where publishing and what our minister of education was publishing and it was very nice, but just not good enough. I really wanted to do it right, that it works. To create it by myself, to be a teacher. . . . Another thing that motivated me was the opportunity to make money out of it and to make a huge impact of the next generation of the engineers of Israel. (Amir Asor, CC5)*

> *. . . we came out and started making the metal-railroad track to differentiate ourselves from just a reseller of*

bricks in a box, . . . to manufacture something that we can call our own a 100% and that is a compliment to the LEGO business. . . . And we did that out of necessity knowing so well, that we will not be able to collaborate with LEGO, although we would like to, because of the lack of originality of our prior works. We have come back with the rail site and we have been told by them [LEGO], to make it as big as we can. (Mike Fetsko, CC4)

Regarding the symbiotic aspect, we find a system of "many entrepreneurial eyeballs" in which lead users, with the assistance of the producer firm and community, continuously recognize and exploit new business opportunities. By starting his or her own venture, the lead user becomes a producer acting on LEGO's behalf. This stands in contrast to the traditional approach of inviting lead users to a producer firm-hosted lead user workshop. This role shift on the part of the lead user obviates effects from the "not invented here" syndrome and allows to leverage the lead users' tacit knowledge for the exploitation of business opportunities. It also enhances fairness perceptions on the side of the lead users regarding intellectual property and returns from the codeveloped innovation. Via their interface with the community, the lead users receive feedback to further improve on their developments and to increase preference fit. An example is a quote from a community forum commenting on MeModels (CC5):

I have some ideas on how to possibly expand the Me railway product line, as you said you were trying to provide LEGO enthusiasts with the complete experience. . . . [explaining a new motor in detail] . . . This would allow us to create the type of Loco we could ever dream of. (User Gondortoast on Eurobricks.com)

Summarizing (drawing on Table V in the online appendix), the LEGO platform and electronic tools implemented by LEGO over the last years allow for a moderate extension of the design space for external lead users which LEGO can also support by its manufacturing capacity. Ideas that are more radical and mean a more distant extension of the design space require that lead users provide more long-term engagement with LEGO and also deliver concrete investments and results from their activities before being considered for cooperation. Regarding the community perspective, the cases document that various LEGO communities support activities that result in additional products or services not thought of or provided by LEGO. Regarding other, non-LEGO-related communities, the name and brand of LEGO has positive signaling effects for extension. In these settings the new communities can become important test markets for the more radical ideas from the lead users.

Creation of Buzz

Being associated with LEGO as well as its user community allows lead user start-ups to leverage communication processes in order to create awareness of their business idea, as illustrated by the following quote:

When the idea of brick engraving reappeared around 2000, I immediately wanted to get in touch with Matt Gerber [then organizer of the fan event BrickWest 2002] to hear what he thought about it. Matt put me in contact with Christina Hitchcock of BrickFest, and Christina asked if I would do the badges for the event. From there, things just kind of took off in the community, and in 2004 I set up my own stand at BrickFest. . . . Everybody in the AFOL community knows that I am "The Original Brickengraver," so now I am asked to do all sorts of things like customized bricks for birthdays and weddings and stuff like that. (Tommy Armstrong, Lead User, CC3)

Description of the Pattern

The symbiotic ecosystem of lead users, the user community, and the LEGO company activate endogenous processes within the user community as well as spillover effects into market segments outside the user community (Figure 4).

The cases show that lead users manage to develop innovations that address emerging needs of the community, thereby attracting its attention. For instance, lead users developed specific educational material (CC2 and CC4), launched a fan magazine dedicated to adult fans of LEGO (AFOL, MC2), or transferred the LEGO play experience to other domains of high interest for a specific community (architectural experience, MC1). Community members who first become aware of the lead user innovation realize its high use value for themselves, become excited, and then start to tell other community members about it. Here the different web 2.0–based platforms from the LEGO company accelerate these "word-of-mouth" processes. For instance, after seeing some pictures of LEGO minifigs laying the new ME rail tracks in computer-aided design drawings and initial speculation, user Greenmtvince wrote on the Eurobrickforum (March 12, 2011): "The only question I have left is: 'How do I preorder?' I want this in my mailbox on the day it's released." The following discussion thread had an outstanding 118 posts. This leads to infatuation on the part of

Figure 4. Synergy: Creation of Buzz
Adapted from Fournier and Dolan (2002).

community members and in turn to a kind of missionary advocacy about the brand and the lead user innovation: a virtuous cycle of word of mouth emerges. We find that some of these processes elevate to more extreme advocacy for a particular lead user innovation:

> *If you are a train builder, this is a game changer, as support for 9v from the LEGO group was dropped a few years ago. This track is a worthy successor to the old track, and offers options for builders old and new. And if you are not a trainbuilder yet . . . now would be a good time to start! (A comment by Joe Meno,* BrickJournal*, MC2, on a MeModel development, CC5, in* Brickjournal*, April 2011)*

Once the lead user innovation becomes available as a commercial product and/or service on the LEGO platform and/or LEGO stores, infatuated community members become the first customers of the lead users' new venture. Furthermore, the lead user innovations increase the attractiveness of the user community for its members. Besides those endogenous processes, the buzz generated within the community also has effects beyond its boundaries. Our case analyses reveal that the buzz generated by lead user innovations within the community spills over into segments outside the community. As Eric Olson and Mike Fetsko (CC4) put it:

> *And as we had all that hype, we had so much traffic this first two weeks we actually had to change web-hosting because we were using so much bandwidth. . . . We had probably, I do not know, how many hits, 10,000 to 12,000 views in a couple of hours. . . . Without using a lot of money in terms of a marketing campaign and using an outside company to push the product, . . . we got more bank-priority-dollar than any other top-notch marketing company that you could hire out there just by doing it in-house allowing the lead-users to push that new product.*

Another quote that aptly illustrates this effect comes from Günther Hölzl (CC6):

> *That was an extreme hype, even if it fades sooner or later. . . . It was really fascinating to see that all of a sudden, the whole world—especially web-platforms and forums dealing with all sorts of technological topics—take up your invention.*

Summarizing this pattern (drawing on Table V in the online appendix), again the different perspectives within the ecosystem across cases can be described: LEGO engages in different kind of activities (e.g., certified professional program) that create buzz and traffic on its core community and design platform. Apart from that, LEGO supports buzz for the more radical ideas or services that are in conformity with its values and norms. The main instruments for creating that are the many electronic tools that LEGO is providing for its community and the individual entrepreneurs (e.g., active discussion forums on the DesignByMe platform). For LEGO entrepreneurs, buzz within the community can provide important information and legitimacy for the start up and its marketing process. It can help to understand market preferences and to adapt products and services accordingly. In the case of topics disliked or not yet discovered by LEGO, it can also help to establish and maintain legitimacy through communities not hosted by LEGO. Regarding the community perspective, all buzz created by members and intensified by ideas/topics from lead users helps to sustain functioning and existence of the community. However, the communities also develop specific rules of interaction that entrepreneurs have to follow. Topics or ideas not accepted

by the core LEGO community might lead to new communities or subunits within the LEGO community.

Discussion and Conclusion

This study takes its point of departure in the growing literature on lead users and user communities participating in the new product development efforts of established producer firms. Prior literature has mainly focused on benefits from user innovation approaches that arise from bilateral interactions between individuals, communities, and firms. However, current phenomena point to the existence and importance of synergies that emerge from even more integrated ways of innovating. Pioneering firms seem to experiment with models in which all participating stakeholders—lead users, user communities, and the focal producer firm—interact jointly (Keinz, Hienerth, and Lettl, 2012).

Analyzing 10 cases of entrepreneurial ventures started by lead users, we find evidence of benefits leveraged from bilateral interactions, adding robustness to prior empirical findings (Franke et al., 2008; Franke and Shah, 2003; Füller et al., 2008; Harhoff, Henkel, and von Hippel, 2003; Herstatt and von Hippel, 1992; Keinz et al., 2012; Lettl et al., 2006; Lilien et al., 2002; Urban and von Hippel, 1988; von Hippel and Katz, 2002). More importantly, novel effects of such integrated producer–user ecosystems are found and described, which add value to the innovation process through different synergies. Three main patterns (synergies) are identified: First, the overall innovation ecosystem reduces prominent entrepreneurial barriers and thus leads to a reduction of risk for the individual actors triggering and facilitating entrepreneurial activities. Second, lead users, together with the user community and the support of the producer firm, constantly extend product lines and tackle new market segments, a process referred to as the extension of the design space. Third, the interaction of all participating actors triggers self-reinforcing processes that create buzz and awareness of novel ideas and products. This aspect contributes to the overall success of the new ventures and the incumbent producer firm. In addition, it provides a positive stimulus for the user community, raising the idea's attractiveness and ensuring sustainability. To the best of our knowledge, this is the first attempt to study and describe a producer–user ecosystem from a synergistic and entrepreneurial perspective, which has important theoretical as well as practical implications.

The major theoretical contribution of this paper is that it complements existing studies that have investigated user innovation approaches by looking at bilateral interactions (e.g., employing the lead user method in established producer firms). Taking the perspective of an integrated user–producer ecosystem enables us to identify synergy aspects that might help to resolve certain shortcomings of user innovation as discussed in the literature (see Table 1). The example of research on lead users illustrates this quite well: Implementing lead users' ideas has so far been associated with high development costs and market risks for the producer firm. As the cases analyzed here show, such risks and costs can be reduced substantially by systematically observing interactions between the lead user and the community, which provide first indications of the attractiveness of the lead users' new development. This connects to the research strand on organizational ambidexterity (Raisch, Birkinshaw, Probst, and Tushman, 2009), in which a central question addresses the balance between external and potentially more radical ideas and knowledge (exploration), and the already established ways of developing new products and serving existing market segments (exploitation). The producer–user ecosystem observed opens up new opportunities for firms to become ambidextrous, continuously and simultaneously exploring and exploiting business opportunities by integrating internal and external actors with the assistance of the user community. Furthermore, this research contributes to the literature on corporate business incubators. Our findings point to a new corporate incubator model centered on lead users and user communities. It leverages synergy effects in all phases of the entrepreneurial process: Regarding the identification of novel business opportunities, an integrated user innovation ecosystem enables an ongoing extension of the design space. During the phase of opportunity evaluation and development, our study shows how the synergies lead to risk reduction for all actors involved. Finally, for the exploitation of business opportunities, the creation of buzz is facilitated by the overall ecosystem.

With respect to managerial implications, our study reveals that producer firms can leverage user innovation approaches beyond their known potential. This is consistent with current literature on the design of organizations for user innovations (Keinz et al., 2012). Leveraging the synergies identified, however, requires the development and maintenance of an appropriate ecosystem comprising a focal producer firm, user communities, and lead users. In the case of LEGO, the company plays an active role in stimulating the users to interact actively and productively in the company's business interest. This role comprises a range of processes such as the triggering of real-time user-to-user interaction via user-friendly online plat-

forms, a transparent policy concerning intellectual property issues, the provision of nonmonetary incentives to users (e.g., status within the user community, joyful online experiences), and the alignment of the solution space that the users can explore with the corporate strategy. In addition, the company provides continuous communication and feedback loops to its active fan base: For example, trained moderators of the company communicate the corporate goals and values and provide feedback to users' ideas. LEGO managers provide innovative users with information on the next steps in case the company decides to develop their ideas further into marketable products. The company also provides an IT environment that enables it to systematically benefit from the users' creativity. For example, monitoring the creative activities of its users online allows the company to learn about emerging trends and the popularity of specific ideas within the community. Finally, the company shifts parts of the user integration process and the associated responsibilities from top management to middle management or to selected employees. This decentralization enables flexibility and responsiveness to emerging user-based business opportunities.

The overarching purpose of the processes mentioned is to establish and maintain a productive and healthy producer–user ecosystem. Concrete measures by the LEGO company to proactively derive synergy effects are still in their infancy and include the systematic monitoring of community reactions to users' ideas.

As becomes apparent, this organization design and facilitation effort requires competences that go far beyond the ability to implement specific user innovation approaches: Producer firms also need to understand the crucial interfaces between the different user innovation approaches/actors and implement them appropriately (Keinz et al., 2012). If implemented effectively, such an ecosystem holds the promise of generating a sustainable competitive advantage which is difficult for competitors to imitate due to its inherent complexity and the required critical mass of engaged users. The case of LEGO illustrates that a strong brand is a key instrument in setting up such an ecosystem and keeping it sustainable (for a similar argument, see Hienerth, Keinz, and Lettl, 2011). In this respect, our study points to new ways to use established brands. Strong brands can help companies to build up a critical mass of engaged users, and they can be an effective means of protecting the company from the fragile nature of communities: especially in markets where users can choose between several communities, there is an inherent risk that once one central user leaves a community, affiliated users will follow, which will generate a herding-out effect and eventually lead to the breakdown of the community (Oh and Jeon, 2007). After all, as membership is voluntary, there is no formal contract that binds a user to a particular community. For individual innovators, our study points out that some producer–user ecosystems may have the potential to provide crucial support in all phases of the entrepreneurial process and to significantly increase the new ventures' prospects of success. The implication for such individuals, therefore, is that it is important to systematically search for an appropriate producer–user ecosystem that fits well with their specific idea.

This study is not without limitations, which mainly concern methodological aspects of case study analyses as well as the transferability of results to other industries. As the case study method is used to study new research areas in an exploratory manner, it has been criticized as an insufficient basis for scientific generalization (Chetty, 1996). Limitations can also arise due to a lack of comparability where only small numbers of cases are analyzed (Perry, 1998). We have tried to reduce such limitations in this study by choosing a large number of interviewees and different data sources in each case. By interviewing multiple respondents such as lead users, members of the user community, industry experts, and employees of the focal producer firm, we were able to include various points of view in all cases. Furthermore, we followed the development of LEGO and the respective entrepreneurs over a period of more than five years, thus adding a longitudinal perspective to our study. With respect to the generalizability of our findings, our study points to product/market-related factors, community-related factors, and focal producer firm-related factors as enabling conditions for the identified user–producer ecosystem approach. These product/market-related factors include a modular product architecture, a technology whose application potential is not yet fully understood (as demonstrated by the lead users, the LEGO brick technology has potential applications in architecture, education, etc.), and a medium to high heterogeneity of needs and market dynamism. Community-related factors are an enthusiastic community that is socially connected by a shared interest in the core product, a critical mass of community members, and the design competence, creativity, and entrepreneurial alertness of at least some community members. Focal producer firm-related factors include the capability of community "management," including transparency and fairness, and the ability to facilitate multiple user-to-user and user-to-producer interactions in order to explore and exploit business opportunities continuously.

Further in-depth research in additional industries is needed in order to control for situational aspects and various industry-specific characteristics. Further research is also required in order to enhance our understanding with respect to the structural components (such as goals, strategy, or structure) and human components (such as incentives, processes, people, or culture) of organization design within the focal producer firm.

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